MULTIMEDIA UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

EEL2026 – POWER TRANSMISSION AND DISTRIBUTION

(LE)

3 MARCH 2018
9-00am – 11-00am
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 4 printed pages (including cover page) with 5 Questions only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

Question 1

(a) What are the three main differences between *transmission* and *distribution lines*?

[6 Marks]

(b) State *True* or *False*

(i) The conductor resistance increases as temperature increases.

[2 Marks]

(ii) Transposition is done to increase the effective inductance of the line, and

[2 Marks]

(iii) Charging current is due to the line capacitance and flows in a line even when it is open circuited.

[2 Marks]

(c) A completely transposed three-phase 50-Hz line has the conductor configuration as shown in Fig. Q1. Given that D_{12} = 5 m, D_{23} = 5 m and D_{31} = 8 m and that the radius of all the conductors, r is 0.3175 cm.

Determine (i) the line to neutral inductance, and

[6 Marks]

(ii) its associated inductive reactance.

[2 Marks]

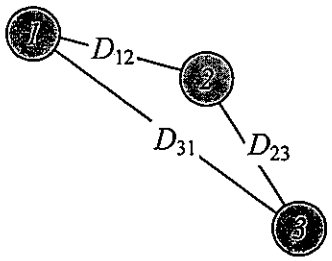

Fig. Q1

Question 2

(a) What is Corona effect in transmission lines and what are the factors that affect Corona?

[6 Marks]

(b) The capacitance per phase of a three-phase 200 km long transmission line having the conductor diameter of d cm is 7.65x10-3μF/km. The spacing between the conductors is 13 m, 15 m and 15 m. Determine the diameter of the conductor and the charging current, if the line is connected to a 50 Hz and 400 kV source. Assume the line is completely transposed.

[6 Marks]

(c) The capacitances of a 3-phase underground cable are 9.0 μF between the three cores bunched together and the sheath, and 4.9 μF between one core and the other two connected to sheath. Determine the charging current drawn by the cable when connected to a 3-phase, 50 kV, 50 Hz supply.

[8 Marks]

Continued....

Question 3

(a) Define the term 'Voltage regulation' of a transmission line. [3 Marks]

(b) A three-phase short transmission line is supplying a load of 250 MW at 0.8 power factor lagging. The voltage at the receiving end is kept constant at 230 kV. The resistance and reactance per phase of the line are 5 Ω and 15 Ω respectively. Calculate the voltage regulation. [7 Marks]

(c) A 132-kV, 50-Hz, three-phase transmission line is 160 km long. The per phase resistance and reactance are 12.84 Ω and 72.76 Ω respectively. The shunt susceptance per phase is 0.583×10^{-3} S. The receiving end load is 55 MVA at 0.8 power factor lagging.

Compute (i) the ABCD parameters of the transmission line, [4 Marks]

(ii) the receiving end current, [2 marks]

(iii) the sending end line voltage, and [2 Marks]

(iv) the sending end current. [2 Marks]

Question 4

(a) What is meant by String efficiency? Suggest at least three methods of improving the String efficiency. [6 Marks]

(b) A string of identical insulators is shown in Fig. Q4. Assume the value of m as 10.

Compute (i) the % voltage distribution across each of the suspension insulators, and [10 Marks]

(ii) the string efficiency. [4 Marks]

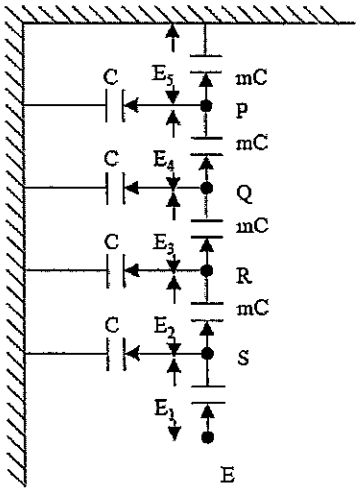

Fig. Q4

Continued....

Question 5

(a) 11-kV voltage is applied to a three-phase distributor having R = 3 Ω and X = 4 Ω per phase. At the end of the line is a balanced load of P MW at 0.6 power factor leading. At what value of P is the load voltage being equal to supply voltage?

[8 Marks]

(b) A single-phase 600 m long distributor fed at end A is loaded as shown in Fig. Q5. The loop resistance and reactance per km are 0.4 Ω and 0.2 Ω respectively. Determine the voltage drop in the distributor and voltage at the far end if the sending end voltage, V_s is $240\angle 0°$ V.

[12 marks]

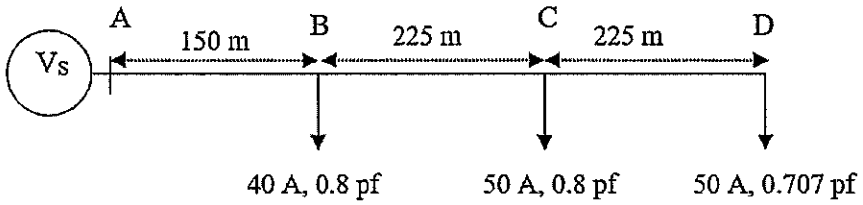

Fig. Q5

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